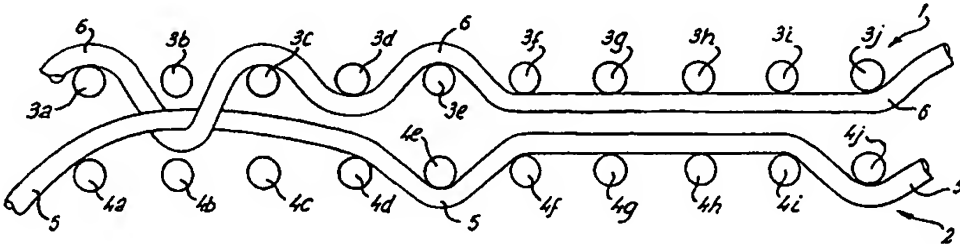




## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<p>(54) Title: TISSUE MARKING FABRIC</p>  <p>(57) Abstract</p> <p>A tissue marking fabric comprises at least two warp yarn systems (5, 6) and one or two weft yarn systems (3, 4). The warp yarn systems are interlaced at spaced intervals, and extensive floats are provided either in the upper weft yarn system (3) extending in the cross-machine direction, or in the upper warp yarn system (14).</p>		

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**TISSUE MARKING FABRIC**

This invention relates to a papermaker's fabric intended primarily for use in the production of patterned tissues, which may be used for example as a forming or drying fabric in the process of tissue paper manufacture.

5 WO 96/35018 (Kimberly-Clark) describes the formation of patterns in a paper or tissue sheet using an integral woven structure on the fabric surface. The imprint in this case is caused by providing systematically distributed densely woven areas in the fabric where drainage of water is relatively slow. As disclosed in the said specification, the drainage may be  
10 impeded by incorporation of additional filaments or fibres on top of or within the forming fabric weave pattern, or by a film or coating which blocks or fills void space within the fabric through which water could otherwise drain. Over the areas of impeded drainage, a thinner layer of relatively long fibres tends to be deposited, whilst shorter fibres migrate and are concentrated in  
15 the area of more rapid drainage, producing a thicker, less translucent tissue over the faster drainage areas.

One method of producing areas of different drainage rate is to provide long yarn floats in the tissue contacting surface of the forming or drying fabric. US 5,429,686 (Chiu) discloses a patterned fabric with long warp  
20 floats provided as an additional sculpting layer superimposed upon the normal fabric weave. These sculpting layer floats can produce a lineated

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or discrete area pattern. This disclosure also relates to relatively high, e.g. over 65% warp cover fabrics, which makes for poor air permeability or drainage.

WO 93/10304 (Nordiskafilt) relates to a papermachine fabric designed to reduce marking of the paper or tissue web by a forming fabric comprising at least two systems of warp threads and at least one system of weft threads, wherein the warp thread systems are interconnected by interlacing the yarns of one warp thread system with the yarns of the other, at least once in each pattern repeat. In a single weft embodiment, extensive warp yarn floats are produced by the yarns of the lower warp system on the machine face of the fabric.

An object of the invention is to provide a tissue marking fabric suitable for use in the wet end of a tissue machine as a forming wire, or as a throughair drying fabric, which is capable of producing desired marking of the tissue, but can be produced without use of supplementary or auxiliary yarns to produce areas of altered drainage.

In accordance with the invention, a tissue marking fabric comprises at least one weft yarn system and at least two warp yarn systems, at least two of the warp yarn systems being interlaced with each other, characterised by the provision of extensive yarn floats on the tissue contacting face of the fabric in either a warp yarn system and/or a weft

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yarn system, the floats being provided by the interlacing yarns.

In a first embodiment, two weft yarn systems may be provided, extending in the cross-machine direction. Two separate warp yarn systems are in this case provided, one associated with the lower weft yarn system  
5 and interwoven therewith, and the other associated with the upper weft yarn system, and each yarn of which is at least partially interwoven with the yarns of the upper weft yarn system, at least some of the warp yarns of the second warp yarn system being passed below two or more of the weft yarns of the lower weft yarn system. This has the effect of creating  
10 weft yarn floats in the upper weft yarn system, which is on the tissue contacting side of the fabric. The warp yarn systems are interlaced in the region of normal weave.

In a second embodiment, a single weft yarn system is provided, with a first warp yarn system associated therewith and interwoven with the weft  
15 yarns. A second warp yarn system is provided comprising yarns which are not interwoven with the weft yarns, but are interlaced with spaced knuckles of the first warp system, for example at each third, fourth or fifth knuckle. This produces extensive floats in the second warp yarn system which are presented on the tissue contacting face of the fabric.

20 The interlacings between the yarns of the first and second warp yarn systems may involve alternate right and left twists given to the second

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system warp yarns.

Two embodiments of fabric according to the invention will now be described by way of example with reference to the accompanying drawings wherein:-

- 5      Fig. 1      is a weave diagram of a first embodiment of tissue marking fabric according to the invention; and
- Fig. 2      is a weave diagram of a second embodiment of tissue marking fabric according to the invention.

Fig. 1 shows a two-ply 10 shaft repeat weave fabric which has two  
10      weft yarn systems 1 and 2, forming upper and lower fabric plies or layers. In both Fig. 1 and Fig. 2, the tissue contacting surface of the fabric is shown to the top, and the machine contacting weaving surface is shown to the bottom. The first upper (tissue side) weft yarn system 1 comprises a plurality of weft yarns 3a-3j. The second lower (machine side) weft yarn  
15      system 2 similarly comprises a plurality of weft yarns 4a-4j, which are disposed directly below the corresponding yarns 3a-3j of the first system 1.

A plurality of warp yarns are woven with the lower system 2, a representative one of which 5, is shown in the drawing. This is woven in a standard 4:1 weave pattern, and thus floats over four weft yarns of the  
20      lower system, and is looped below one of the weft yarns in the lower system, in each weave repeat.

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Further warp yarns such as 6 are woven into the upper weft yarn system, as shown in a 1:1 weave with the first five threads 3a-3e of a 10 shaft repeat, and then woven below the next five yarns 3f-3j of the upper weft system, as shown. Successive warp yarns 6 may be stepped one  
5 thread to the right or left with reference to the drawing. As a result, each weft thread of the first yarn system, such as 3f-3j as shown in the drawing, is exposed for example five warp yarns and thus floated in contact with the tissue.

Yarn 6 and yarn 5 are interlaced once in each repeat, as shown  
10 between weft yarns 3b and 4b.

Fig. 2 shows a single ply 8 shaft repeat weave fabric which has a single weft yarn system 11, with a plurality of weft yarns 12a-12h in each repeat.

A system of warp yarns such as 13 is interwoven into the yarn  
15 system 11, in for example a 1:1 weave pattern as illustrated. The warp yarns may be relatively displaced to the left or right of the drawing by one weft thread at each pick, so that loop knuckles alternate in bridging weft yarns.

A further layer of warp direction yarns 14 is provided, and these as  
20 shown, are interlaced once in each weave repeat with the warp yarns 13 of the main yarn system. Each successive warp yarn is preferably advanced

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to right or left in the drawing by the space of one weft yarn. The warp yarns 14 of the further layer provide extensive warp direction floats, in place of the weft direction floats provided in the Fig. 1 embodiment.

As noted above, extensive yarns floats on either the warp or weft  
5 direction can alter the drainage properties of the fabric, and thus provide for desired marking on a prescribed pattern of a tissue web formed or dried on the fabric. The distribution of knuckles and floats may be arranged in the tissue contacting layer as desired to provide any suitable pattern on the marked tissue, for example reticular, or conforming to a decorative image.

10 The interlacing of the warp yarns 5, 6 can be achieved by the warp threads being drawn in special leno heddles which during weaving shift the warp threads sideways, i.e. parallel to the weft threads. This leno heddle motion for a warp thread takes place when the warp thread in the warp thread system facing the paper web is positioned below a weft thread  
15 interlacing with this warp thread. A fabric may contain layers or areas which have been thus interlaced alongside or interlayered with conventionally interwoven multiply fabrics.



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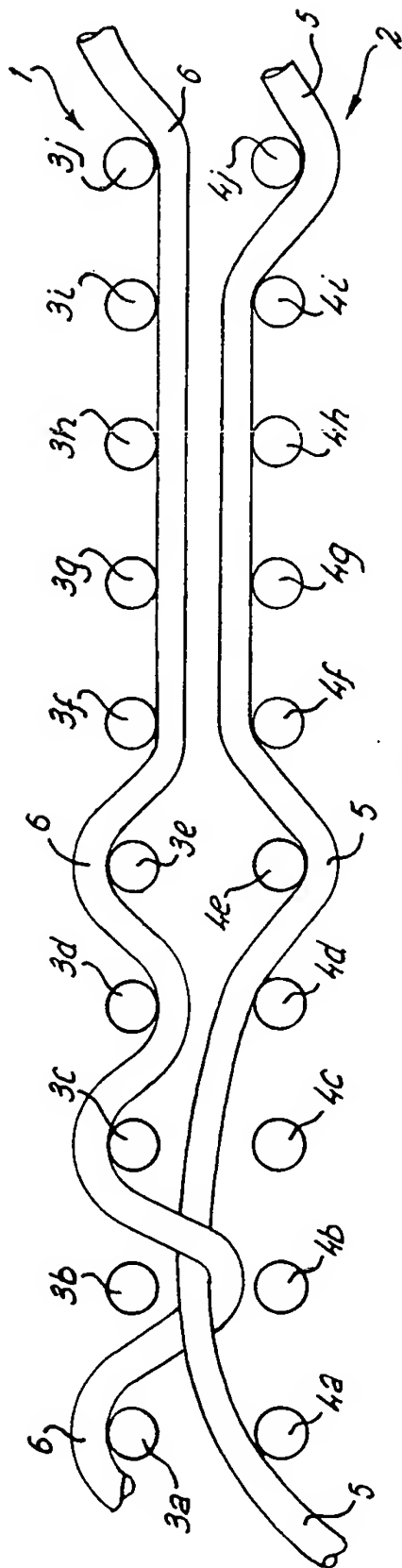
**CLAIMS**

1. A tissue marking fabric comprising at least one weft yarn system and at least two warp yarn systems, at least two of the warp yarn systems being interlaced with each other, characterised in that  
5 extensive yarn floats are provided on the tissue contacting face of the fabric in a warp yarn system and/or a weft yarn system, the floats being provided by the interlacing yarns.
2. A tissue marking fabric according to claim 1, wherein two weft yarn systems are provided extending in the cross-machine direction, two  
10 separate warp yarn systems being also provided, one associated with a lower weft yarn system and interwoven therewith, and the other associated with an upper weft yarn system, each yarn of said other systems being at least partially interwoven with the yarns of the upper weft yarn system, and at least some of the warp yarns of the  
15 second warp yarn system being passed below two or more of the weft yarns of the lower weft yarn system to thereby create weft yarn floats on the tissue contacting face of the fabric.
3. A tissue marking fabric according to claim 1, wherein a single weft yarn system is provided, and a first warp yarn system associated  
20 therewith and interwoven with the weft yarns, a second warp yarn system also being provided and comprising yarns which are not

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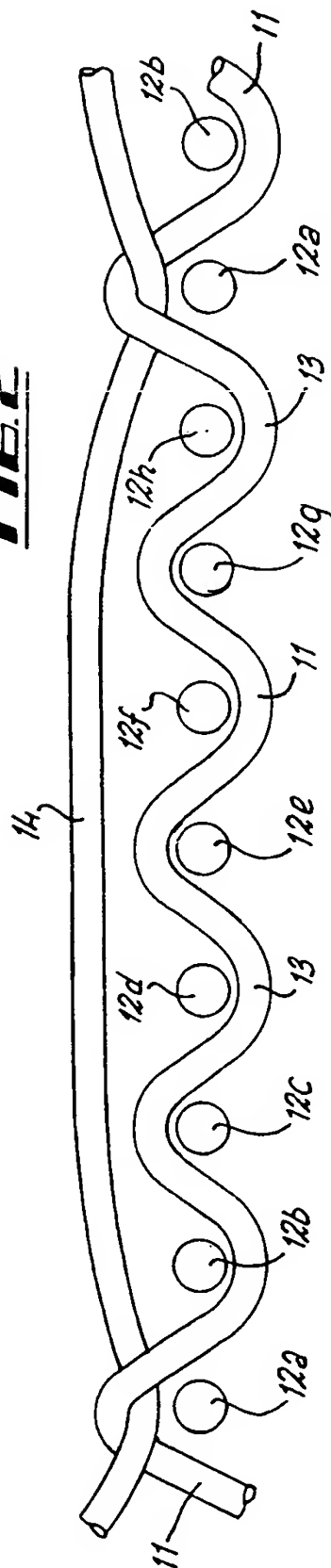
interwoven with the weft yarns, but which are interlaced with spaced knuckles of the first warp system, to thereby produce extensive floats in the second warp yarn system which are presented in the tissue contacting face of the fabric.

- 5      4. A tissue marking fabric according to any preceding claim, wherein the interlacings between the yarns of the first and second warp yarn systems may involve alternate right and left twists given to the yarns of the second warp yarn system.



**FIG. 1**

**FIG. 2**



# INTERNATIONAL SEARCH REPORT

Int. National Application No.

PCT/GB 99/02793

**A. CLASSIFICATION OF SUBJECT MATTER**  
 IPC 7 D21F11/00 D21F1/00

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 D21F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 93 10304 A (NORDISKAFILT AB) 27 May 1993 (1993-05-27) the whole document	1-4
A	US 5 429 686 A (CHIU ET AL) 4 July 1995 (1995-07-04) the whole document	1
A	US 5 713 397 A (QUIGLEY) 3 February 1998 (1998-02-03) the whole document	1

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search

17 December 1999

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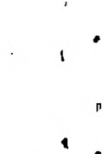
# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 99/02793

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
WO 9310304	A	27-05-1993	SE 469432 B AT 157717 T AU 654890 B AU 3053792 A BR 9206959 A CA 2123883 A DE 69222056 D DE 69222056 T EP 0614501 A FI 942328 A, B, JP 7501109 T MX 9206717 A NO 941848 A SE 9103461 A US 5458693 A	05-07-1993 15-09-1997 24-11-1994 15-06-1993 28-11-1995 27-05-1993 09-10-1997 12-02-1998 14-09-1994 19-05-1994 02-02-1995 01-08-1993 04-07-1994 23-05-1993 17-10-1995
US 5429686	A	04-07-1995	AU 682957 B AU 2200395 A BR 9506222 A CA 2163096 A CN 1127019 A DE 69506668 D DE 69506668 T EP 0708857 A ES 2125610 T JP 8511838 T WO 9527821 A ZA 9502943 A	23-10-1997 30-10-1995 30-09-1997 19-10-1995 17-07-1996 28-01-1999 05-08-1999 01-05-1996 01-03-1999 10-12-1996 19-10-1995 20-12-1995
US 5713397	A	03-02-1998	NONE	



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